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ANALYZING THE PERFORATION FORCE BEFORE, DURING AND FOLLOWING CARDIAC ABLATION

Poster Contributions
Hall C
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Background: Clinical perforation of the atrial wall may lead to pericardial effusions and/or life-threatening cardiac tamponade. It is suggested that such may result from high contact forces to ensure the creation of transmural lesions. It has been reported that cardiac tamponade occurs in 1.3% of ablation procedures. It should be noted that patients with atrial fibrillation (AF) have thinner atrial walls; this likely creates circumstances for perforation to happen more readily. Therefore, better understanding the required contact forces for proper lesion formation while minimizing rupture may lead to the reduced occurrences of cardiac tamponade.

Methods: Fresh atrial samples from Yorkshire Cross swine (n=72) and humans (n=4) were carefully dissected out. Atrial samples (n=448) were randomized to the following study groups: 1) no treatment, 2) Radiofrequency (RF) ablation for 1 min at 30 W with a temperature limit of 65°C, 3) RF ablation perforating during the last 5 seconds of ablation, or 4) focal cryoablation for 2 minutes. All samples were carefully anchored, then therapy applied, and an ablation catheter was advanced at a rate of 500 mm/min until perforation occurred.

Results: Catheter perforation forces for the left atrium (344±86 g) and right atrium (275±95 g) were significantly different for all groups ($p<0.01$). There was a significant difference in perforation force between species ($p<0.01$). Importantly, the RF ablation groups required significantly lower forces to induce perforations than the control group ($p<0.01$). Catheter size had a significant affect on perforation force ($p<0.05$).

Conclusions: Understanding the factors that may lead to atrial perforations is essential, since cardiac tamponade remains a potential complication of ablation procedures. This is the first translational study to specifically investigate relative atrial perforation forces with a variety of catheter sizes during and after the application of RF. This acquired data should be particularly useful for clinicians, engineers, and scientists to reduce the occurrence of cardiac tamponade during AF ablations, while yet ensuring the elicitation of transmural lesions.